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CHINA REPORT
SCIENCE AND TECHNOLOGY

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PROBLEMS IN DEVELOPMENT OF COMPUTER SCIENCE DISCUSSED

Shenyang ZHONGXIAOXING JISUANJI [MINI-MICRO SYSTEMS] in Chinese No 4, 1981 p 35-38, 12

[Article by Chen Shukai [7115 2885 2818], secretary for academic affairs of the Chinese Computer Society: "A Discussion of Several Problems in the Course of Development of Computer Science and Technology in Our Nation"]

[Text] Learning a little materialists dialectics and the materialist view of history and using this scientific method of knowledge to explore some problems in the course of development of computer science and technology in our nation are beneficial. This article will talk about some viewpoints from several sides. It is not an overall discussion, there may be mistakes, and correction are welcome.

I. The computer industry in our nation began in 1956. The history of 25 years of development can generally be divided into four stages. From 1956 to 1958, from nothing to something, a research organization was established to train scientific research and technical forces, and an electron tube computer was built according to Soviet blueprints. It was a period of budding, establishment and laying the foundation. The period from 1958 to 1966 was a period of development. Achievements were great, and some deviations began to emerge. While purging the "leftist" mistakes, we must not underestimate the achievements. During this period, a series of technological foundations were established: A technological team was trained in scientific research, production, application and education related to computers; corresponding organizations were established; a thousand computers were developed and manufactured; applications in some fields were developed, and these served in several sectors of national defense and the national economy. This writer believes that among the problems that emerged during this period were the following: During this period there was lack of study of the patterns of development of computer science. The proportion of the distribution of forces of the branches of the science was inappropriate; for example, insufficient attention was paid to peripheral equipment, software, basic research and the development of applications, and onesidedness was evident in the internal configuration of the hardware. The various links of scientific research, production, and use did not form a lively closed loop feedback chain. Development of applications was not carried out in a big way; national defense applications, military applications and scientific computation were not transformed into applications in the national economy and applications centered around data processing. The years between 1966 and 1976 were the 10 years of upheaval, as everyone knows; there was destruction and standstill, and at the same time, the leftist guiding ideology also developed to an extremely serious degree. This is an analysis of the whole situation. We do not exclude the fact that individual projects were developed during this period which achieved some results.

The period from 1976 to the present can be further divided into the first 2 years and the last 2 years. During the first 2 years, the "leftist" guiding ideology was still evident in such phenomena as not actually catching up and blind introduction of foreign technology. After the Third Plenum, especially after the Working Conference of the Central Committee at the end of 1980, we began to purge these leftist mistakes at the roots. This is a good beginning that has not been easy. Reorganization began, and this directed computer science and technology onto a healthy and serious track suiting objective patterns.

The major problems manifested were those of rushing, aiming high and superficiality. Rushing means rushing to seek achievements, rushing to become successful for gain, but achievements were sacrificed for speed. Aiming high means aiming at lofty goals unilaterally (actually not lofty goals but impossible to be true lofty goals), and impractically high speed. Superficiality means seeing only the surface or one side of a problem; there was subjectivism, but hard work in studying and exploring the objective patterns of development was scarce or nonexistent. Of course, in the scientific and technological realm, there was an even deeper level of leftist mistakes, such as the views regarding the nature of science and technology, and the debate as to whether scientific and technical personnel were the masters of society or the target of "movements" and subjects of criticism, etc. These were all common things in scientific and technological circles. This article is aimed at emphasizing the analysis of some individual technical problems in computer science.

While emphasizing the purge of leftist mistakes, we must also pay attention to correcting other mistakes. In considering concrete problems and events, we must start out from the actual situation; we cannot use one frame of mind to fit all. Things in this world are not uniformly the same.

II. The computer, from the birth of the world's first unit to the present time, has a history of 36 years. The period from the emergence of the idea of the principles of programmed computational operations and memory functions to the present was only a little over 100 years. Are there any patterns or any visible characteristics in the course of development? The answer is affirmative. Let us first analyze modern science and technology of the past 100 years. Science and technology are an aspect of human social activity. The ancient times had ancient science and technology. From the time of the emergence of capitalism, the 16th and 17th centuries, up to the first half of the 19th century should be called the period of recent science and technology. In ancient science and technology, people's understanding of nature and the development of production techniques was very incomplete, the understanding of nature was onesided. To connect these understandings to form a unified understanding of nature required the addition of many hypotheses and guesses. And these were limited by the level of the whole productive abilities of the time. Experiments using precise and automated observations and analytical computations were not possible. Recent science and technology still used and could only use basically this type of research method, which was to take out objective things and events, natural phenomena and physical processes from the whole, temporarily not considering their development, for concentrated study of their current change. Many individual and partial phenomena can be observed and experimented with. Intellectual activity of the individual can discover scientific rules within a definite scope and under definite conditions. The history of development of recent science and technology over several hundred years contributed greatly to human civilization and progress. A large number of scientific achievements were realized. But the 100 years since the second half of the 19th century, and especially modern science and technology formed during the decades after World War II, are characterized by advances from

individual handicraft industries via the management method of collectivization to an era of national and even international macrosience. Whether in scientific research, production or application, they all frequently require large-scale and mutually coordinated experiments to advance from individual operations to socialization. (Of course, this does not exclude the basic sciences, some of which can be studied by an individual or a few people independently, but they are also beginning to need complex technical support systems).

The visible characteristics of the development of modern science and technology are:

1. The continuous strengthening of the degree of specialization and comprehensiveness. Understanding of the objective world and reforming the objective world have led to these two contradictions: Specialization and comprehensiveness. On the one hand, to deepen the understanding and recognition of the objective world, the division of labor in science and technology has become finer and finer, and new frontier sciences have continued to emerge. On the other hand, to solve various concrete problems of the national economy and social life, these finely divided specializations must be combined before the various types of problems can be solved. Relying on a certain science and specialization is futile. They all need strong and forceful technological support, they all contain questions about systems and setups, and they cannot be solved by individual effort. Of course, the level of systems and setups still must be developed, the important thing is to grasp the concept of "the borderlines."
2. Science and technology has broadly infiltrated into the economy, society and culture, and commercial transactions. Science is a potential productive force, technology is the means to convert it into a productive force of society; this means that science and technology are a type of productive force, they constitute an important force that seriously affects economic and social activity.
3. The scale, difficulty and cost of scientific and technological research are becoming larger and larger.
4. The period from the realization of modern scientific and technological achievements to the appearance of new products from these achievements has greatly shortened. It can also be said that their movement and change are very dynamic, the half-life of knowledge has greatly shortened. For example, the period from the invention of the electron tube in 1904 to the first electron tube computer (1946) spanned more than 40 years; the period from the invention of the semiconductor transistor to the building of the semiconductor computer was about 10 years; the period from the development of microelectronic precision processing technology to the integrated circuit computer was only 1 to 2 years; the development of the ultramicroprocessing technology to the fourth-generation computer were almost in step. Of course, this trend is not absolute.
5. "Technical breakthrough" types of science and technology have gradually given way to "systemized" types of science and technology. The three major discoveries of the early period (the cell, energy conversion, Darwin's theory) and the major technological breakthroughs from 1925 to 1950 numbered over 40. The level of technology during the 1940's and 1950's covered atomic energy, computers and semiconductors, space technology and synthetic plastics. These achievements were all technological breakthroughs successfully developed on the foundation of new principles, and they brought about revolutionary change in the whole body of science and

technology. During the first half of the period from the 1950's to the 1960's such new technological breakthroughs greatly decreased; statistical studies of the 1970's show that technological breakthroughs produced by entirely new discoveries and new inventions and relying on new principles became fewer and fewer. From the latter part of the 1970's to the present, it appears that the scientific principles and technology already possessed are being systematically combined, thus forming new technologies that are completely different from the original technologies. For example, although the basic principles of the computer have been developed greatly, they have not broken away from the ideas of 100 years ago concerning programs and memory storage. Also, as Weber [phonetic] the person in charge of planning the American Apollo missions, said: "The technology of the Apollo spacecraft does not contain even one new breakthrough; all the technologies are based on already existing principles; the key is whether they can be accurately and flawlessly organized and placed under systems control to form a brand new technology." In 1971, the Japanese Science and Technology Agency predicted that the 1980's would be the peak years of systems combination type technologies.

Computer science and technology have more typically and centrally manifested the characteristics of the development of modern science and technology. It is a new technological science that involves an extremely broad range of scientific fields and an extremely strong comprehensive science. It has its own structural strata; it requires the study of basic theory, basic materials, and the basic components. We can say that many physical, chemical, mechanical and biophysical...research results were all quickly absorbed by computer science. Components, whole units, and systems must also be studied, and applications in every realm must be examined. Therefore, based on the categories of scientific research, there are basic research, applications research, developmental research, and afterward there are product development, mass production, and popularization and application. Scientific research, production and use are mutually connected as a unified whole, i.e., scientific research, economy and social life are dialectically unified. In the unified entity, each of the three has a respective position and definite technology, and they form a nonplanar feedback cycle which rises "spirally".

Because of the lack of research in the objective patterns and their characteristics, the following problems have emerged:

1. Computer science and technology is large and complete, forming its own system. In the macroscientific era in which science and technology have become socialized, it is difficult to continue the ways of individual handicraft industries, "not seeking any help from anyone". Our nation's computer science and technology needs specialization and division of labor and at the same time it needs overall technical coordination to form a joint economic and technological entity of scientific research, production and utilization. To achieve this is very difficult; the superstructure suitable for this type of development must be established; various obstacles must be overcome, such as the remnant ideology of "feudal separatism", etc.
2. The organic whole and the closed loop feedback links are separated and disjointed, causing an imbalance in ratio. For a long period, in the whole chain, emphasis was placed only on the whole unit, and in the whole unit, emphasis was placed only on computational speed. The viewpoint was, apparently, that if the computer could compute so many millions of operations a second, this would constitute "catching up and surpassing". This view and this way of doing things are very onesided. It is not possible to "catch up and surpass" in this way. Also, continuing in this way for a long time, pursuing one item of one link, will create a vicious cycle, just like destroying the ecological balance in nature.

These problems will necessarily lead to the following results:

1. We cannot talk about the performance price ratio.
2. The boundaries of the various kinds of research are confused. "There are no blueprints and there is no information". Such ridiculous and naive things as propagandizing the manufacture of semiconductor integrated circuits in the lavatory, etc. have emerged.
3. The fine division of labor and combination are violated; products are expected to be immediately effective and to be able to yell and jump. Therefore, over the past dozen or so years, some factories have looked like laboratories, and research institutes have looked like testing shops in factories, causing confusion in the division of labor between the scientific research system and the production and factory system, and preventing them from developing their advantages.
4. The categories of research are violated. Jumping from applied research and even basic applications research to products and engaging in large projects have resulted in an extremely large proportion of trial produced products, high consumption, and long periods of development; but these products cannot really be put into production, and only some gifts, samples and showpieces are produced; they cannot really be part of a productive force in society.

III. Applications must be developed in a big way before the computer can truly develop. The viewpoint of application is the viewpoint of practice. A statement in the theory of the materialist view of history says: Without practice by the masses, it is also difficult for science and technology to develop. In the problem of developing applications, we have not grasped well the key knot and "degree" of qualitative and quantitative change.

The general international experience is that whether application of a nation's computers can rapidly be popularized and serve their proper function in the national economy depends on whether their use can be expanded in these two directions: 1) expanding from military applications to civilian applications (used in all sectors of the national economy); and 2) expanding in content from scientific computation to data processing, information processing, and knowledge processing.

In computer applications, numerical computation (including scientific computations) constitutes only 5 to 10 percent, while non-numerical computations (mainly data processing, information processing...) constitutes about 90 percent. Although the course of development of computers in most nations started out from military applications and then expanded to civilian applications, and went from scientific computations to data processing, the timeliness of the changeover and the speed of change affected the development of the computer greatly. This requires grasping the key nodes and "degree" of the patterns of qualitative and quantitative changes. The United States made the change at the beginning of the 1950's. The Soviet Union began to pay attention to the application of computers in the various sectors of the national economy in 1966, and by 1968 to 1972, application of computers in the Soviet Union had undergone a fundamental change. In 1968, the number of computers used in industry and by enterprises constituted only 9.1 percent of the total number of computers in the nation. But by 1972, the number of computers being used in industry, transportation, construction and agriculture already constituted over 65 percent of the total number in the whole nation.

Our nation's computers were first used in military applications and for solving equations of mathematics and physics. But for over 20 years, until recently, many computer research institutes with relative strength were still developing computers mainly for scientific computations, and it is very difficult to connect them to the needs of the various sectors of the national economy. A change in the emphasis of computer applications in our nation has been advocated by computer circles for many years, but this has not been solved yet. This writer believes this is because of the mainstream leftist mistakes committed for many years in our nation's socialist construction. Under this leftist guiding ideology, business management departments would not listen to the sincere opinions of scientists and would not implement helpful measures; therefore, over so many years, the role of computers has not widened but has become narrower.

A comparison of the changes in application in China, the United States and the Soviet Union is as follows:

	<u>Beginning</u>	<u>Change in application</u>	<u>Remarks</u>
China	1956	End of 1970's	According to the same comparable indicators, our nation is 10 years late in changing
United States	First computer built in 1946	Beginning of 1950's	
USSR	1950	Mid-1960's	

Let us look at the ratio in the production and applications links: The manpower and materials invested in the application of computers in foreign nations are several times the manpower and materials invested in production.

	<u>Major manufacturers</u>	<u>Service companies</u>
China	Over 80	Established in 1980
United States	100 (top 100 manufacturers)	In 1975, 2,550 companies
Japan	Over 300	In 1978, 1,672 companies

Compare the ratio of production personnel and popularization and applications personnel of just one computer company in China and the United States.

	<u>Total</u>	<u>Production personnel</u>	<u>Popularization and applications personnel</u>
U.S. Wang Laboratories	10,000 persons	2,000 persons, 20%	8,000 persons, 80%; software, popularization, applications service constitute 1/3 each
A computer manufacturer in China	7,500 persons	7,450 persons, 99%	40 to 50 persons, 0.6%

In emphasizing the development of applications in a big way and in completing computer applications, on-sidedness in these two changes should also be carefully guarded against.

1. Emphasizing application means emphasizing application on the basis of a definite ratio within the system and the structure described in the previous section. Basic research and such efforts should not be relaxed.

2. Completing the change does not mean that numerical computation is no longer important or has become less important. It is very important, and the absolute amount is still increasing. However, because of the rapid development of data processing, information processing and knowledge processing, because of their massive amount and broad scope, the amount of numerical computation as a relative percentage of the total amount of work is decreasing day by day.

IV. The electronic computer, as its name implies, is a machine that utilizes the motion of electrons to carry out computations. Viewed from any direction, this name no longer fits the object it represents. It is only because it is the customary term that we shall temporarily call it that. The computer, in reality, is an automated information processing system. Its content as described above far surpasses the field of electronics. The computer has advanced from numerical computation to information processing, knowledge of the human brain. Artificial intelligence is by nature the future of development of computers. Therefore, the future development of computers comes in contact with fundamental questions of philosophy. The present computers can only be regarded as "having knowledge" but not as having "intelligence" yet. Knowledge is useful information that exists within an individual. Intelligence is the ability to utilize the information to achieve certain specific goals.

The question of the relationship between existence and thought is a fundamental question of philosophy. Existence is primary, it is the origin. Thought is secondary, it is the reflection of existence. Thought is reflected and processed by the highest substance in man--the human brain. If the computer can complete artificial intelligence, then it will be the materialization of thought. This precisely proves the correctness of Marxist philosophy. During the cultural revolution, simulation of human intelligence by the computer was criticized as a question of idealism; it was said that if the computer could achieve artificial intelligence, if it could think, then people would become slaves of the computer. Actually, scientific and technological achievements of the early period--machines--liberated man's physical labor; modern scientific and technological achievements--computers--have partially and conditionally liberated man's mental labor. This is the objective pattern. For example, cars travel faster than man, cutting pliers are stronger than the human hand, but for several hundred years, man's legs and hands have not degenerated but have become more versatile. The computing speed of the computer is much faster than man's, the memory capability is strong, but the computer will never surpass human wisdom. People have given the computer their intelligence and talent, the computer has liberated man's mental labor, it is an extension of human wisdom, making people smarter.

The various big debates in philosophical circles of the Soviet Union directly affected the development of the computer. The Soviet Union criticized the theory of mechanization of the brain; it believed that the development of computers to substitute for a part of the function of the human brain would be an idealistic development. This type of criticism was unfounded in theory, but it delayed the development of computer science and cybernetics in the Soviet Union by 5 to 10 years. It was only after Comrade Stalin died that the Soviet Union built its first computer research institute.

The process of understanding the materialization of man's own brain also coincides with the Marxist theory of knowledge, i.e., the process of practice, recognition, practice, repeated recognition, repeated practice. Actually, the whole history of the development of the computer is a process of continuous understanding of man himself while he changes the objective world. When man's intelligence was not yet materialized, thought was shrouded in mystery. As parts of specific intelligence materialized one after another, the brain was described as a clocklike and gear-type machine. During the 1950's, the human brain was described as similar to the memory of a computer composed of 10^{10} electron tubes. The cerebral cortex has about 10^{10} nerve cells. When the neurophysiologists concluded through scientific research that one nerve cell is linked to about 1,000 nerve cells surrounding it, this nerve cell is equivalent not to an electron tube but to a microcomputer which is linked to 1,000 other microcomputers. Thus, the human brain is similar to a huge information processing network system composed of 10^{10} microcomputers. In fact, such understanding still leaves many questions unanswered, and the tall mountain of intelligence is still before us.

We should conscientiously explore patterns in practice so that objective and subjective views will be consistent. We believe whole heartedly that by following this road with all efforts, our nation's computer science and technology will surely develop healthily and will provide greater service in the four modernizations of the nation.

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DJS 240, 260 PASS EVALUATION

Beijing JISUANJI SHIJIE [COMPUTER WORLD] in Chinese 5 Nov 81 p 1

[Text] (By our own correspondent) DJS 240, 260 computers are medium- and high-grade computers in the 200 series suitable for scientific calculations, real-time control and data processing. The first and second 260 computers, designed by the 200 Series Combined Design Group and built by the Huabei Computer Technology Institute, passed evaluation respectively in August and November 1979 and were delivered to the users. The first 240 computer passed evaluation in January 1981 and was delivered to the users. Production of the third and fourth 260 and the second and third 240 computers has begun. Up to now, four models in the DJS series--DJS 210, 220, 240 and 260--are all available to the customers.

The primary frequency of the 240 computer is 3.3MC. The basic command execution time is between 0.6 μ S and 6.6 μ S. There are 187 commands. Maximum capacity of the main storage is 32K double words x 8. There are a total of 187 subchannels. It can activate at most 240 pieces of I/O equipment. The configuration of peripheral equipment is fairly complete. Software of the entire system is compatible and is equipped with DJS 200XT1, XT2, XT3 systems, DJS 240, 260 real-time operational system, and DJS 200 supervisor. It also has all kinds of generalized and high-level languages.

The primary frequency of the 260 computer is 4MC. The execution time of the basic commands is between 0.25 μ S and 3.75 μ S. There are 187 commands. The maximum capacity of the main storage is 32K double words x 4. The channels, peripheral equipment and software are basically the same as those of the 240 computer.

Chinese-made small-scale integrated circuits are employed in the 200 series. Practice has demonstrated that comparatively stable medium- and large-sized computers can be made entirely from these Chinese-made small-scale integrated circuits. Take the 240 computer as an example: The 53150 individual components, totaling 11 different varieties, were assembled after having been checked and screened. Except for a new circuit chips that failed early, the machine has now operated 6,000 hours and, in the main, no components have been replaced. When the computer was delivered for evaluation, it ran as long as 150 hours continuously and the computer was stopped manually. The users were also satisfied with the stability of the 260 computer.

In order to increase the speed of the main frames of the DJS 240 and 260 computers, in addition to employing rationally parallel operation and concurrent calculation,

some high-speed calculations, such as 12-bit multiplication and iterative division used on 260 computers, were used, while 8-bit multiplication and iterative division were employed on the 240 computers. The 240 computer adopted the streamlined technique. More than half the commands can be completed with 250nS preprocessing and processing. For this reason, the average calculation speed of the 260 computer can exceed 1 million operations/ second, while the 240 computer can reach 500,000 operations/second.

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APPLIED SCIENCES

NORTH CHINA TERMINAL EQUIPMENT COMPANY FOUNDED

Beijing JISUANJI SHIJIE [COMPUTER WORLD] in Chinese 5 Nov 81 p 11

[Text] (By our own correspondent) The North China Terminal Equipment Company was founded on 6 October in Baoding City by combining the state-operated Jianshan Machinery Plant and the Baoding Electronic Instruments Plant in Hebei on the principle of volunteering and mutual benefits and in carrying out the joint operations of the Central and local government-operated enterprises. Li Rui [2621 3843], head of the State General Bureau of Computer Industry, attended the inaugural meeting.

The North China Terminal Equipment Company is the first company in the country charged with the task of producing computer terminals. Its equipment is excellent and it has a comparatively strong technical force that has many years of experience in the production of computer peripheral equipment. Establishment of the company will help in serializing and specializing the production of computer terminals and in upgrading product quality and in specializing large scale production.

The company institutes the management responsibility system under the leadership of the board of directors. It has set up technical development, production design, sales service, and finance and supply departments, and two production plants. The technical development department devotes its efforts toward designing, trial producing, and developing new products, such as Chinese character intelligent terminals, all types of CRT displays and DJS060 series microcomputers and single-plate computers. The sales service department will render such services as doing repairs and conducting technical training for the users.

The North China Terminal Equipment Company is located in Baoding City, Hebei Province. It can now supply ZD-2000 Chinese character intelligent terminals, ZD-1110, ZD-1220 character displays and MC6800 series single-plate computers. [Guang Mao; 1684 2021]

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CSO: 4008/24

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CSO: 4008/19

Building Structure

AUTHOR: SHEN Zaikang [3088 0961 1660]
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ORG: None

TITLE: "Fatigue Behavior of the Normal Section of Partially Prestressed Concrete Beams and Its Calculating Method"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese
No 5, 1981 pp 1-13

TEXT OF ENGLISH ABSTRACT: Based on the static and fatigue experiments of 16 pieces of I-section test beams and 3 pieces of prototype I-section crane girders, the fatigue behavior of partially prestressed concrete beams has been studied. The stress variations of prestressing steel in the cracking section and the development and closure of flexural cracks under repeated loading have been analyzed. In addition, the calculating method for the stress of prestressing steel and controlling conditions of crack width are also presented in the paper.

AUTHOR: LU Zhitao [0712 1807 3447]

ORG: Nanjing Institute of Technology

TITLE: "Strength Calculation of Reinforced Concrete Members Subjected to Combined Biaxial Bending and Tension"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese
No 5, 1981 pp 14-25

TEXT OF ENGLISH ABSTRACT: Based on analysis and discussion for evaluating the strength of tension members under uniaxial bending, an ultimate strength method for designing symmetrically reinforced concrete members with rectangular section subjected to combined biaxial bending and tension is suggested and the equations used in this method are derived.

Results obtained by the proposed method have been compared with those from tests. The comparison shows that they are in good agreement with the test results.

AUTHOR: WU Zhixian [0702 5267 6343]
HU Qingen [5170 1987 1869]
CHENG Dazheng [4453 1129 2973]
et al.

ORG: All of the Shanghai Institute of Industrial Architectural Design

TITLE: "Building Frame Using Precast Reinforced Concrete Columns of Multistory Height with Cast-in-place Beam-to-column Connections"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 26-37

TEXT OF ENGLISH ABSTRACT: This paper presents a new design of precast reinforced concrete columns of multistory framed structures with exposed sections at each floor level for cast-in-place beam-to-column connections. The design procedure and detail requirements for the reinforcements at the exposed sections of columns used in a recently erected building are described.

This paper also reports experimental results obtained from a full scale test. The experimental results are in close agreement with those predicted by the proposed equations. Brief comments have also been made on connection details.

AUTHOR: WANG Lei [3769 4320]

ORG: Hunan University

TITLE: "Analysis of Strength of Elastic Plates by Least Square Method--Sine Series and Polynomial Try Functions"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 43-54

TEXT OF ENGLISH ABSTRACT: In this paper, sine series and polynomial beam functions are derived. They can satisfy various boundary conditions of beams, such as the simply supported ends, fixed ends and free end. As for elastic flexural plates under various boundary conditions, the undetermined parameters can be solved by the theory of minimization of least square method. Since they satisfy the boundary conditions, they can be considered as try functions of the interior method of weighted residuals.

AUTHOR: LIU Kaiguo [0491 7030 0948]

ORG: Hubei Design Institute of Industrial Buildings

TITLE: "The Computing Method of Interaction of Soil-Foundation-Frame System"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 55-72

TEXT OF ENGLISH ABSTRACT: In this paper, the interaction of soil-foundation-frame system is calculated and a mathematical model is presented, assuming that the stress-strain relation obeys the theory of elastic half-space. The vertical displacement of the frame belongs to the shear type structure. The differential equation is derived therefrom and solved by using finite differences and series.

Numerical examples are given in this paper, and tables compiled by matrix are presented in the appendix.

AUTHOR: PAN Fulan [3382 1788 5695]

ORG: Fifth Design and Research Institute

TITLE: "Determination of the Compressional Stiffness Coefficient in Homogeneous Soil"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 73-79

TEXT OF ENGLISH ABSTRACT: In this paper, according to the results of field tests and theoretical analysis, the formulae for calculating the compressional stiffness coefficient in homogeneous are presented from the point of view of variable rigidity. These formulae reflect the properties of soil strata of considerable depth, the computed results are in good agreement with the actual conditions, and the defects in the theory of constant rigidity in computing the compressional stiffness coefficient have been overcome.

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CSO: 4009/75

AUTHOR: WANG Chuipu [3769 0987 2883]
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ORG: WANG of the Nanjing Automation Research Institute, Ministry of Electric Power; ZHANG of Nanjing Electric Power and Automated Equipment Plant, Ministry of Electric Power

TITLE: "A Telemetric Type of Displacement Meter Used in Dam Observation"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 5-14

TEXT OF ENGLISH ABSTRACT: In China, in measuring the horizontal displacement of concrete gravity dams and buttress dams, a steel wire is usually mounted in the gallery of the dam as the reference line in observation. We have designed a new type of displacement meter so as to render this kind of dam observation more effective than before. In order to match the requirements of long distance of reference line and a number of measuring points and, at the same time, to reduce error due to those contact measuring devices, the following scheme is adopted in developing a new displacement meter: The horizontal displacement of the dam is measured by a photoelectric device and, with the aid of a differential inductance sensor, the measurand is converted into electric quantities for telemetering. As shown by laboratory and site tests, the meter is of high accuracy and stability.

AUTHOR: LIU Zhibin [0491 5268 1755]

ORG: Water Conservancy and Hydroelectric Power Research Institute

TITLE: "A Miniature Stress Meter for Internal Stress Measurement"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 15-24

TEXT OF ENGLISH ABSTRACT: This paper deals with design, manufacture and application of a miniature stress meter for laboratory tests of structure models.

In order to measure internal stress correctly, the stress meter should satisfy the definite rigidity matching relation, $(E'/E_0)(F'/F_0)(H_0/H') = 1$. Since it is difficult for gypsum to meet the above requirement due to its plasticity, the method of structural design is adopted to reduce error due to incomplete matching.

As shown by experiments, the developed stress meter is in conformity with the required technical specifications. It can measure the tensile stress as well as the compressive stress inside a structure with error less than ± 5 percent.

AUTHOR: GONG Weixuan [7895 4850 4821]
CUI Guofan [1508 0948 5400]

ORG: Both of Wuhan Hydropower College

TITLE: "Investigation of Settlement of Dam by Mathematical Statistics"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 25-32

TEXT OF ENGLISH ABSTRACT: In this paper, the treatment and analysis of the observed data for earth dam settlement according to the basic principle of mathematical statistics leads to the conclusion that its optimum curve is a logarithmic one.

AUTHOR: ZHOU Xingbao [0719 5281 1405]

ORG: Yuecheng Reservoir Management Office

TITLE: "Horizontal Displacement Observation on a Reservoir Dam and Its Accuracy Analysis"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 33-45

TEXT OF ENGLISH ABSTRACT: This paper describes the horizontal displacement observation based on triangulation in combination with alignment survey on an earth dam of Yuecheng (County) Reservoir. The accuracy of measurement is assessed through theoretical analysis.

AUTHOR: BIAN Youxin [0593 0642 2450]

ORG: Nanjing Automation Research Institute, Ministry of Electric Power

TITLE: "A Brief Introduction to the YS-1 High Pressure Oedometer"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 46-48

TEXT OF ENGLISH ABSTRACT: The YS-1 high pressure oedometer is a lever-type consolidation apparatus with lever ratios of 1:10 and 1:12. The sampel area may be 50 or 30 cm², on which the maximum stress will come up to 20 and 40 kg/cm² respectively.

In testing, the sample is placed in a cell where it is constrained laterally and allowed to drain vertically. A graded axial load is applied to the sample by a lever-loading machine. The YS-1 oedometer can be employed for determining the amount of deformation and the relation between deformation and time.

9717

CSO: 4009/78

Energy

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TITLE: "Variable-speed Constant-frequency Wind Generating Systems Utilizing Field Modulated Generators"

SOURCE: Beijing TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA] in Chinese Vol 2 No 4, Oct 81 pp 353-362

TEXT OF ENGLISH ABSTRACT: The wind generating systems utilizing variable-speed constant-frequency systems can allow the rotational speed of wind turbine to vary with wind speed and operate at a constant and optimal tip speed ratio. Therefore, the wind turbines can maintain an optimal power coefficient over a wide range of wind speed and the complex and expensive speed regulating mechanism can be eliminated.

The field modulated generator system is a new variable-speed constant-frequency generating device. In this system, a specially designed three-phase high frequency alternator is excited by low frequency alternating current. The output, which is a modulated sine wave, is rectified, inverted and filtered to yield the constant

[Continuation of TAIYANGNENG XUEBAO Vol 2 No 4, Oct 81 pp 353-362]

frequency output independent of the prime-mover. This generator is specially suited for wind generating systems operated in parallel with the power grid. In this case, the excitation of the generator may be immediately obtained from the grid. The generator system synchronizes with the grid automatically. Therefore, the control and stabilization problems of the system can be greatly simplified.



(a)



(b)

Variable-speed constant-frequency wind generating apparatus utilizing field modulated generators.

[Continuation of TAIYANGNENG XUEBAO Vol 2 No 4, Oct 81 pp 353-362]

This paper makes a comparison between constant-speed constant-frequency and variable-speed constant-frequency wind generating systems, describes the electric circuit and the principle of operation of the field modulated generator system, presents the operational and control aspects of a wind generating system utilizing this generator and experimental results of a 4 kW prototype coupled with a 6 meter Darrieus vertical axis wind turbine in a large wind tunnel.

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CSO: 4009/110

Geology

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TITLE: "The Geological Characteristics and Mineralization Mechanism of the Stratiform Lead-Zinc Ore Deposits within the Zone of Lead-Zinc Deposits along the Eastern Flank of the Central Xikang-Yunnan Axis"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981 pp 420-426

TEXT OF ENGLISH ABSTRACT: The stratiform lead-zinc ore deposits at the eastern flank of the axis occur in the carbonate rocks of Upper Sinian, Lower Cambrian, Upper Ordovician and Middle Silurian. They are characterized by a consistent stratigraphic position, simple mineralogy and a similar assemblage of associated elements, and are invariably located in the semi-closed epicontinental basins with alternative sedimentation in large and small cycles.

The material source of the ore deposits is the mineralizing material-bearing weathering crust of the Presinian old land. Due to marine transgression, Pb and

[Continuation of DIZHI LUNPING Vol 27 No 5, 1981 pp 420-426]

Zn were leached into water bodies. Under the influence of gyres of sea water, Pb and Zn elements migrated from the shallow area to the deep sea basin, and became increasingly concentrated with continuous halmyrolysis. During the late period of the Dengying (Sinian), as the crust rose, the climate changed, organisms died in large amounts, the H₂S content increased dramatically, the pH value in the sea water became high and the oxidation-reduction interface changed, ore-forming elements lost their balance and thus Pb and Zn sulfides were precipitated and concentrated in the relatively stable sea waters in the semi-closed sea basin.

AUTHOR: DENG Keqi [6772 0344 2630]

ORG: No 2 Surveying Designing Institute, Ministry of Railways

TITLE: "On the Phenomenon of CO₂ Natural Outflow in Baomashan, Central Yunnan"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981
pp 437-443

TEXT OF ENGLISH ABSTRACT: CO₂ gas with normal atmospheric temperature and high concentration has been found to flow out to the land surface in the central part of Yunnan Province. The pressure of the gas issuing at the land surface is low.

The source of the gas seeps is the sandstone layer in the upper part of the "central Yunnan redbed." Their localities are related to geological structural and geomorphological conditions: they are distributed on the gentle slopes and in the valleys where reservoirs or cultivated land are on the opposite sides of the watersheds.

The gas is stifling. For example, it may cause injuries and death when escaping in wells and pits, and insects die near gas holes.

In this paper, a model for CO₂ natural outflow process is proposed, the characteristics, mode and types of gas outflow are discussed, and changes in behavior of the gas during its outflow and the gas-water contact are elucidated.

AUTHOR: None

ORG: Institute of Geology, Chinese Academy of Geological Sciences

TITLE: "The Discovery of Alpine-type Diamond-bearing Ultrabasic Intrusions in Xizang (Tibet)"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981
pp 455-457

TEXT OF ENGLISH ABSTRACT: Through the study of chromite deposits, diamond has been discovered in Xizang. According to the results of the field work as well as the petrological and petrochemical data, we confirm that these diamond-bearing ultrabasic masses belong to the Alpine-type. There are two masses. One occurs in northern Xizang and the other in southern Xizang. Both of them cover about 60-70 km². The ultrabasic rocks are composed mainly of harzburgite, peridotite and dunite. The grain size of the diamond ranges from 0.1 to 0.5 mm. Two grains of diamond were collected from harzburgite and dunite in the southern mass. Others were obtained from natural heavy fractions just around the northern mass.

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CSO: 4009/85

Internal Combustion Engine Engineering

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ORG: WANG, HOU, XU, JING and ZHOU all of Changchun Motor Vehicle Research Institute; JIN of Jilin University of Technology

TITLE: "The Influence of Constructional Parameters of Bathtub-type Chamber on Combustion Performance"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 1-9

TEXT OF ENGLISH ABSTRACT: The constructional features of the bathtub-type combustion chamber of the 6105 gas engine have been improved by increasing the combustion rate and the stability of the combustion process by means of enlarging the squish area, improving the compactness of the combustion chamber and changing the position of the spark plug. Remarkable effects have been obtained in lessening the handicaps brought about due to excessive thermal load, higher exhaust temperature and greater noise emission of the original engine.

AUTHOR: CHEN Xinwen [7115 6082 5113]
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ORG: CHEN Xinwen, HAO, MA and CHEN Wenkui all of the Shanghai Internal Combustion Engine Research Institute; LU of the Shandong Institute of Technology; LI of the Linshu Agricultural Machinery Works

TITLE: "A Report on the Design, Manufacture and Testing of a Backswept Bladed Centrifugal Compressor Impeller with Controlled Exit"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 10-18

TEXT OF ENGLISH ABSTRACT: In this paper, the design principle, manufacturing technology and testing results of a backswept bladed compressor impeller with controlled exit are described and analyzed. When compared with the ordinary radial bladed compressor impeller, its adiabatic efficiency increases by 4 percent, its effective flow range at rated speed widens by 11.4 percent, and its maximum efficiency zone enlarges by 42 percent.

[Continuation of NEIRANJI GONG CHENG No 3, 1981 pp 10-18]

The principle and boundary of surge of centrifugal compressor with certain vaneless diffusers are interpreted and predicted, and are confirmed as well by this experiment.

AUTHOR: YAN Xinben [0917 0207 2609]

ORG: Shanghai Diesel Engine Works

TITLE: "Investigation of the Turbocharged Diesel Engine Operated at High Altitude"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 19-28

TEXT OF ENGLISH ABSTRACT: Based on the bench test of the 6135 Q-1 turbocharged diesel engine at the altitude of 3810 meters in 1977, the running characteristics and adjustment approaches of that turbocharged diesel as well as its experimental results are reviewed. Other problems relating to any turbocharged engine operated at high altitudes are discussed at the same time.

AUTHOR: HE Wanxiang [0149 8001 4382]
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ORG: HE and WANG both of Tianjin University; HU of Nankai University

TITLE: "A Study on the Dynamic Behavior of a Flying Ball Centrifugal Type Governor"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 29-41

TEXT OF ENGLISH ABSTRACT: This paper presents in detail the method of setting up a mathematical model for determining the dynamic behavior of the governor system in a generating set. The calculation is programmed according to the given model. A large number of calculations show that the calculating results are basically compatible with the measured values; therefore the accuracy of the mathematical model is confirmed, and the principal parameters which affect the dynamic behavior of the governor, the optimum values and permissible variation of some parameters are found out at the same time.

AUTHOR: WANG Changrong [3769 7022 2837]
XU Qifa [1776 6386 4099]

ORG: Both of the Shanghai Institute of Railway Technology

TITLE: "Testing and Analyzing Rubber Torsional Damper Used on Diesel Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 42-53

TEXT OF ENGLISH ABSTRACT: This article deals with the principle of decreasing torsional vibration by installing a rubber torsional damper in the crankshaft system of the diesel engine and offers the practical methods of measuring the basic characteristics of the damper.

By means of the static characteristic test with alternate loading, free damped oscillation test and dynamic damped characteristic test, the main performance parameters of the rubber torsional damper, such as natural frequency, dynamic stiffness, static stiffness, the ratio of dynamic to static stiffness and the ratio of dynamic damping coefficient, etc., can be measured, providing necessary material for calculating the torsional vibration of diesel engines as well as designing and employing the rubber torsional damper.

AUTHOR: YU Zheng [0151 6927]

ORG: Shanghai Marine Diesel Engine Research Institute

TITLE: "Derivations and Applied Analyses of the Theorems of Inertia Loads of Wobble Plate(s) on the Supports in Spatial Mechanism Wobble Plate Engines"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 54-64

TEXT OF ENGLISH ABSTRACT: For those wobble plate engines employing CSSRR* or other spatial mechanism, the inertia loads of the wobble plate(s) on the supports are the vital subjects in the dynamic analysis. The inertia load theorems of three types of rotational symmetric rigid wobble plates (i.e., static balance type, non-static balance type and the type used in the rotary cylinder unit engine) are derived and their practical meanings are also discussed. In addition, the inertia loads of the wobble plate in Model 8E 250 diesel engine are calculated and the related equations derived from existing wobble plate engines are listed for reference.

AUTHOR: LIU Yuzhao [0491 5940 2507]

ORG: Second Automobile Factory

TITLE: "The Running Smoothness of the Valve Gear in Model EQ 6100 Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 65-75

TEXT OF ENGLISH ABSTRACT: In this paper, a discussion is presented of the existing problems and approaches toward resolving them concerning the running smoothness of the valve gear in model EQ 6100 engine. This paper emphasizes the measurement of valve gear stiffness, calculation formulas of distributive probability of flexibility, and the main points toward increasing its stiffness, etc.

AUTHOR: YANG Yongping [2799 3057 1627]

ORG: Automobile Factory No 2

TITLE: "The Power Correction of Gas Engines--Discussion of the Power Rating of IC Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 76-82

TEXT OF ENGLISH ABSTRACT: Based on the derivation and analysis of the power correction formula of a gas engine, the influences of mixture pre-heating and atmosphere temperature variation on the volumetric efficiency of different types of gas engines are discussed. The functions of the temperature index and mechanical efficiency in the formula must be taken into consideration.

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CSO: 4009/90

AUTHOR: FU Shimin [0265 0013 2404]
ZHANG Longxing [1728 7127 5281]
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ORG: All of Wuhan Institute of Iron and Steel Technology

TITLE: "Investigation of Gas-flow in Furnace Shaft"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 10-17

TEXT OF ENGLISH ABSTRACT: Based on the principle of fluid dynamics and model experiments in the laboratory, the authors of this paper have made investigations of gas flow in the non-irrigated zone of the furnace shaft. From the viewpoint of two-dimensional steady state flow, the authors describe the law of gas flow in the non-irrigated zone by mathematics. The fluid resistance was measured and calculated to the flow of several packed beds, for example, uniform, nonuniform beds and mixed burdens, horizontal and V-shaped layers, by different charging system. Additional resistance to the flow in the interfacial regions of coke and glass spheres was measured and described by theoretical analysis. A suggestion is presented to control optimal gas distribution by measuring the permeability index ($Q^2/\Delta P$) at different parts of the furnace during operation.

AUTHOR: YANG Zhaoxiang [2799 0340 4382]
DUAN Zhenying [3008 2182 3467]

ORG: Both of Northeast Institute of Technology

TITLE: "An Investigation of Alkali Reduction Kinetics in the Blast Furnace Slag Containing Fluorine"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 18-25

TEXT OF ENGLISH ABSTRACT: In this paper, the alkali reduction kinetics in the blast furnace slag containing fluorine have been studied and the test program was planned by second degree regression orthogonal method. According to the test results, it is shown that increasing the slag basicity, slag temperature and content of CaF_2 in the slag may promote the reduction of alkali oxide. Based on the mathematical treatment of these results the regression equation has been given. It may be used to calculate the reaction rate constants for reduction of potassium oxide with different basicity, temperature and CaF_2 content of slag. Based on the data, it may be concluded that the reduction of alkali oxide in slag is the first order reaction and its reaction rate is controlled by the interface chemical reaction. For dealkalinization reaction, the apparent activation energy has been determined in the range of 35.9 - 122.8 kcal/mol and it is increasing with the decreasing basicity and CaF_2 content in slag. The reaction rate of potassium oxide is greater than that of sodium oxide by 8.8 times. The authors of this paper have suggested a rational formula to express the total alkali load in the

[Continuation of GANGTIE No 9, 1981 pp 18-25]

blast furnace. Through systematic analysis of the test results, a mathematical statistics model to calculate the circulating alkali store in the furnace has been established.

AUTHOR: NA Baokui [6719 1405 7608]

ORG: Central Iron and Steel Research Institute

TITLE: "On the Oxidation Behavior of Vanadium in Molten Iron Refined by Sodium Carbonate"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 26-32

TEXT OF ENGLISH ABSTRACT: In searching for an economical and rational process for recovery of vanadium from molten iron containing vanadium, the iron was treated with Na_2CO_3 flux. The effects of [Si] content, basicity of the slag, flux consumption, refining temperature and Fe_2O_3 addition were investigated. The experimental results led to the conclusion that Na_2CO_3 can effectively remove vanadium, silicon, phosphorus and sulfur, but has little effect on carbon. To obtain good results, it is necessary to keep Si content in the metal below 0.3 percent, basicity ($\text{Na}_2\text{O}/\text{SiO}_2$) above 4, flux consumption more than 30 g/kg·Fe and temperature as low as possible (preferably within 1300-1350°C). Addition of Fe_2O_3 to the flux will promote oxidation of vanadium. Under the condition of Na_2CO_3 consumption at 35 g/kg·Fe and temperature of 1300°C, a vanadium residual content of 0.03, a slag of 13.5 V_2O_5 and a 90 percent recovery of vanadium will be expected.

AUTHOR: LU Shaohai [4151 4801 3189]
HUANG Zhengqi [7806 2973 3825]
MA Gengqiu [7456 1649 4423]

ORG: All of Wuhan Iron and Steel Company

TITLE: "The Research on the Technology of Manufacturing the Work Roll for Sendzimir Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 33-39

TEXT OF ENGLISH ABSTRACT: This paper centers around the manufacturing technology of the work roll of Sendzimir 20-high mill, including the selection of the material, melting, heat treatment and cold working. This work roll is developed by the Co-containing material, medium-frequency induction hardening technique as well as by the cold working of the centering hole.

The work roll manufactured by the above-mentioned technology has many advantages, such as high strength with lath martensite structure, high resistance to cracking and lower consumption factor, etc.

This paper is intended to discuss the above problems with regard to theory and practical application.

AUTHOR: LI Lianshi [2621 6647 6108]

ORG: Beijing University of Iron and Steel Technology

TITLE: "Calculation of Rolling Load in Two-roller Skew Piercing Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 40-43

TEXT OF ENGLISH ABSTRACT: This paper gives simple formulas for calculation of parameters related to rolling load: rolling force, guide force, axis force, mean specific pressure and contact area between rolls and metal in tube piercing mill. These formulas are obtained based on a great deal of experimental data measured.

A theoretical method for calculation of rolling torque is also discussed. This method facilitates technical calculation with sufficient accuracy.

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TITLE: "Causes for Life Increasing by Rare Earth Addition in a Fe-Cr-Al Heat-resistant Alloy"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 44-50

TEXT OF ENGLISH ABSTRACT: During rapid life test at 1350°C nodules of Fe-enriched oxides were formed in the oxide scale when the aluminum content in Fe-23Cr-6Al alloys decreased to the level of about 1 wt percent. Growth of these nodules generally led to rupture of the test wire. The expense of aluminum in the alloys was greatly slowed by addition of 0.15 wt percent La, 0.15 wt percent Ce or 0.60 wt percent Y, hence the test life of the alloys increased by 4-6 times.

On the α -Al₂O₃ scales of the alloys containing rare earth elements, no oxide ridges were found. Therefore, the scales were lightly adherent to the substrate and the oxidation rate of the alloys did not increase rapidly with the cyclic change of the temperature. No crack and nodules were found on ridge-free scales and the isothermal oxidation rate of alloys also decreased. In addition, the protective scales also prevented nitrogen in the air from penetrating into the alloys to

[Continuation of GANGTIE No 9, 1981 pp 44-50]

form AlN. All these factors made the expense of Al in the alloys containing rare earth elements slow down.

On high-temperature oxidation, rare earth elements usually formed internal oxides. Enrichment of rare earth elements in early oxide scales was found.

AUTHOR: CAO Yongjia [2580 0516 1367]
WANG Honghai [3769 3163 3189]
LUO Xiyu [5012 6932 5940]

ORG: All of the Central Iron and Steel Research Institute

TITLE: "Properties of P/M High Speed Steel"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 51-57

TEXT OF ENGLISH ABSTRACT: The properties of P/M high speed steel W12Cr4V5Co5 (FT15) have been studied. Powder of this P/M steel was prepared by nitrogen atomization and solid materials were compacted by hot extrusion. Hot extrusion is beneficial to crushing the oxide layer on the surface of the powder particles, thus reducing the adverse effect of oxygen on the properties of the metal. The microstructure of the powder and characteristics of extruded bar are described. Based on the experimental results the parameters of heat treatment for this P/M steel were established. Their physical and mechanical properties were determined and the fracture surfaces were investigated. Wear resistance and cutting tests were performed in comparison with the conventional high speed steels.

9717
CSO: 4009/98

Lasers

AUTHOR: ZHANG Peilin [1728 1014 2651]
ZHAO Shuoyan [6392 2592 1280]

ORG: Both of the Laboratory of Laser Physics, Qinghua University

TITLE: "Frequency Characteristics of Passive Cavity for Pulsed Dye Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 9, Sep 81 pp 1-6

TEXT OF ENGLISH ABSTRACT: A new method for calculating selected frequency and linewidth of a passive cavity for pulsed dye lasers is presented. Several typical cavities containing gratings, etalons and resonant reflector as frequency selective elements are studied. The influence of groove number of gratings and optical thickness of the resonant reflector upon linewidth are discussed. The theoretical values are in agreement with the experimental results.

AUTHOR: ZHU Dayong [2612 1129 0516]
ZHONG Lianji [0022 1670 1015]

ORG: Both of Chengdu Institute of Radio Engineering

TITLE: "Stark-effect Modulation of CO₂ Lasers with NH₂D"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 9, Sep 81 pp 7-10

TEXT OF ENGLISH ABSTRACT: The molecular Stark effect in NH₂D is used to modulate strong P (20) line at 10.6 μ m of a CO₂ laser. A modulation depth of 41 percent is obtained from a 400 Hz 20 V rms sinusoidal modulation signal and a 440 V DC bias applied to a 20 cm gas cell outside the laser at a gas pressure of 5 torr. The maximum modulation depth of the gas cell is calculated as 42 percent, which is in good agreement with the experimental results. When sinusoidal modulation signal is 2 MHz 20 V rms, a modulation depth of 12 percent is achieved. NH₂D was prepared by mixing ND₃ and NH₃, and ND₃ was prepared by the present authors.

9717
CSO: 4009/104

AUTHOR: None

ORG: Shanghai Level Instrument Plant

TITLE: "The TS-1 Center-matching Projection Instrument"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 9, 20 Sep 81 p 13

ABSTRACT: The center-matching projection instrument may be installed in boring, milling, drilling, coordinate grinding machines, and the principal shaft hole of spark machining tool to aim accurately at the marked position or the coordinate point of the work piece to cause it to be aligned with the center of rotation of the major axis of the tool so as to improve machining precision of the tool. This paper is written as an advertisement for the projection instrument manufactured by the Shanghai Level Instrument Plant. Technical data, and the method of installing and using the instrument are briefly described.

AUTHOR: None

ORG: Shanghai Liantang Machine Tool Plant

TITLE: "The B60100 Shaping Machine"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 9, 20 Sep 81 p 37, front cover

ABSTRACT: The Shanghai Liantang Machine Tool Plant was assigned as the factory to remodel the equipment of Shanghai Municipal Bureau of Machine and Electricity No 1. It has been manufacturing the B665-1 shaping machine for several years and has the specialized technical manpower and equipment. Its research on making the B60100 began last year and the successful resultant product has now been certified to have reached the ministry's quality standards. The plant has commenced to manufacture it in batches to supply the remodeling needs of the machine industry. The major technical specifications of the shaper are included in the paper. A photo of it is reproduced on the front cover of this issue of the journal.

6168

CSO: 4009/21

Mechanical Engineering

AUTHOR: ZHONG Wanxie [6945 8001 0533]

ORG: Research Institute of Engineering Mechanics, Dalian Institute of Technology

TITLE: "On the Application of Generalized Displacement in the Finite Element Method and Its Implementation"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 15-30

TEXT OF ENGLISH ABSTRACT: In this paper the application of generalized displacement in the selection of the structure analysis model in the finite element method is discussed, such as plate lattices, the master-slave relationship, the generalized displacement and structure symmetry, etc. In addition, the computer implementation method of the governing generalized displacement is discussed and the algorithm is briefly described by meta language expression.

AUTHOR: CHEN Huibo [7115 1920 3134]

ORG: Taiyuan Heavy Machinery Factory

TITLE: "Production Practice of Compound Curve Roll on Two-roll Cross Rolling Piercing Mill"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 47-52

TEXT OF ENGLISH ABSTRACT: The two-roll cross rolling piercing mill is widely used in hot rolling seamless tubes. In the past it was considered that the piercing involved "surface contact" between the barrel-shaped rolls and the piercing-rolled metals. However, this is not a scientific concept. The author of this article has found that there is a disconnected contact curve on the contact surface. Thus, the conjugate contact drive is formed through the contact curve.

In putting forward the design theory of compound curve roll, the author adopts the linear contact concept in the article, and the production practices on the $\phi 76$ and $\phi 100$ two-roll cross rolling piercing mills have proved that the design and computation are correct. The article recommends the adoption of the compound curve roll in the design of all Mannesmann-type piercing mills, providing steady piercing and strengthening piercing conditions, thereby greatly increasing the productivity and improving shell quality.

AUTHOR: LIU Yu [0491 1342]

ORG: Harbin Electrical Wire Works

TITLE: "Analysis and Design of Pulse Control Temperature System"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING]
in Chinese Vol 17 No 3, 1981 pp 53-67

TEXT OF ENGLISH ABSTRACT: This article deals with three questions:

1. Use of the SCR units initiated only at zero phase in every period control temperature, thus escaping the interference of mains caused by initiating the shifting phase.
2. Introduction of the constancy principle to turn the system of nonlinear variable parameters into the linear stationary system, removing the interference on the systemic function caused by the main voltage variation.
3. It is both simple and accurate to obtain the two- or three-dimensional state equation and the output equation directly from the time response curve of the controlled object.

AUTHOR: CHEN Xichen [7115 3356 3819]

WANG Zulun [3769 4371 0178]

YI Sunsheng [2496 1327 5110]

et al.

ORG: All of the Institute of Physics, Chinese Academy of Sciences

TITLE: "The Investigations of the Modification Mechanism of Al-Si Alloys with the Addition of Sb"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING]
in Chinese Vol 17 No 3, 1981 pp 68-77

TEXT OF ENGLISH ABSTRACT: At present there are different points of view on the modification role of Sb in Al-Si alloys. This paper describes the effect of adding Sb to the crystalline process, and topography of eutectic Si and the trail of Sb are studied in this paper. A comparison is also made with adding Na. The results show that the eutectic state changes after adding Sb and an AlSb compound appears in the Si phases. The role of Sb is to separate dispersed crystals of AlSb from the melt and these dispersed crystals are the heterogeneous nucleus of Si.

AUTHOR: ZOU Zixiang [6760 3320 4382]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "The Principles and Methods of Aerodynamic Design of a Seriation Axial Turbine and Its Tests"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 78-89

TEXT OF ENGLISH ABSTRACT: In this paper, a technical line of designing the seriation turbochargers CZ and the characteristics, principles and methods of designing a seriation axial turbine are described. In addition, some test data of the turbine stage efficiency are presented.

AUTHOR: ZHANG Hong [1728 3163]

ORG: Beijing Institute of Aeronautics and Astronautics

TITLE: "Influence of Diamond Form upon Dressing Accuracy of Form Grinding Wheel and Its Elimination"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 90-96

TEXT OF ENGLISH ABSTRACT: The form of the diamond used for dressing the form grinding wheel has an unnegligible influence upon the dressing accuracy. The following measures may be adopted individually or simultaneously to improve the dressing accuracy:

- 1) Decrease the form error of the diamond, such as choose a sharper diamond or sharpen it in case it is dull, polish the diamond into exact radius, etc.;
- 2) Decrease the dressing pressure angle γ_D of the dressing mechanism;
- 3) Grind the stylus of the dressing mechanism in accordance with the form of the diamond.

9717

CSO: 4009/74

AUTHOR: ZHANG Xianglin [1728 4161 2651]

ORG: The 3403 Factory

TITLE: "Effects of Carbides on the Mechanical Property of Steel"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 10, 25 Oct 81 pp 15-23

ABSTRACT: The shape, size, and distribution of carbides form the major microstructural parameters of steel. Diffusion of carbides is the important strengthening mechanism and also influences the toughening of steel. This paper emphasizes the effects of carbides on strengthening and toughening and the mechanical property of steel. Thermodynamic and kinetic characteristics of carbide diffusion and factors affecting carbides are also introduced.

AUTHOR: CHEN Fufu [7115 4395 4395]

ORG: Shanghai Jiangnan Shipbuilding Plant

TITLE: "Pollution-free Electrolytic Carburization"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 10, 25 Oct 81 pp 26-29

ABSTRACT: This paper introduces in detail the carburization mechanism and required equipment for electrolytic carburization. Experiments to test the relationship between the current density and surface carbon concentration, the relationship of density distribution of the test specimen, the relationship of the depth of the carburization layer and the electrolytic carburization work procedure, and the structural characteristics of the electrolytic carburized layer are reported. Actual preliminary applications of the technique are also described.

6168

CSO: 4009/120

Nondestructive Testing

AUTHOR: ZHANG Shunquan [1728 5293 3123]

ORG: None

TITLE: "An Analysis of Design Principle of Electronic System of Short Dead Zone Ultrasonic Thickness Gauge Model CSHCH-3"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This is a new approach to design of a short dead zone ultrasonic thickness gauge, utilizing a mathematical model of the electronic automatic control system. The tail of the first echo pulse from the boundary of the delay block will be cleared by means of the compensation regulator with electronic network. It is practical to shorten the dead zone to 0.3 mm for steel at 5 MHz and 0.2 mm at 10 MHz.

AUTHOR: CHEN Yuwen [7115 5148 2429]
JI Bu [1323 2975]

ORG: Both of Shanxi Metal Structure Plant

TITLE: "Ultrasonic Inspection of T-shape Fillet Welds"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 8-15

TEXT OF ENGLISH ABSTRACT: The authors introduce the method of ultrasonic inspection of partial-penetration and full-penetration T-shape fillet welds. Transverse wave testing from wing is adopted for the former and both transverse and longitudinal wave testing are used for the latter.

AUTHOR: ZHOU Jianguang [0719 1367 0342]
ZHENG Yufang [6774 3768 5364]
GUO Yanyi [6753 3348 0308]

ORG: All of the Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Characteristic Analysis of Lithium-Sodium Niobate Ceramic for Ultrasonic Transducers"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981
pp 16-19

TEXT OF ENGLISH ABSTRACT: In this paper, the dielectric and piezoelectric properties of a modified lithium-sodium niobate (LNN) piezoelectric ceramic are described and analyzed. For the sake of comparison, the properties of some ceramic compositions which are in ordinary use are presented. The modified LNN ceramic has a proper coupling value and very low dielectric constant. The important characteristic is that the LNN ceramic has very high frequency constant of about 3250 Hz·m and low density of about 4.49 g/cm³. All these properties are available for high frequency ultrasonic probes used for thickness measurement and nondestructive testing. The practical application shows that the LNN ceramic is a good material for ultrasonic transducers of high frequency with high damping, high resolution and less dead zone.

AUTHOR: SONG Shulin [1345 2579 2651]

ORG: Taiyuan Heavy Machinery Plant

TITLE: "Mode Transformation of Ultrasound on Heterogeneous Boundary and Determination of Crack Height"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981
pp 20-23

TEXT OF ENGLISH ABSTRACT: During ultrasonic testing, the size and location of defects are determined according to the amplitude and position of echoes on the screen. Spurious defect echoes and edge peak-wave of a defect often appear in practical testing because of the mode transformation on heterogeneous boundary. This article discusses the cause and conditions under which the spurious echoes will occur and their identification method. It also describes the application of edge wave to determine the size of plane defect.

AUTHOR: ZHENG Shicai [6774 0013 2088]

ORG: Xinli Machine Plant

TITLE: "Simple Mathematical Analysis of the Method for Locating Flaws with Thin Test Plate"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 24-25

TEXT OF ENGLISH ABSTRACT: In this paper a mathematical analysis is given of the method for locating flaws with the thin test plate used in weld inspection. It is shown that the horizontal 1:1 adjustment is actually to make the slope of a straight line $T=K_{a1}+K_b$ equal to 1. The method for locating flaws is discussed.

AUTHOR: SUN Shuqing [1327 2885 7230]

ORG: Shaoguan Cast Forge Factory, Guangdong

TITLE: "Discussion of Defect Size Determination in Ultrasonic Longitudinal Wave Testing by 6 dB Drop of Back Reflection"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 26-27

TEXT OF ENGLISH ABSTRACT: This paper briefly analyzes the problems existing in ultrasonic measurement of large defects by the conventional half-amplitude method. However, the use of 6 dB drop of back reflection method for size determination of large defects is also investigated and discussed, and the preliminary test results show that this method is feasible.

AUTHOR: LING Jianchu [5677 1696 0443]
CAO Kuijun [2580 1145 0689]

ORG: Both of Liyang Machinery Plant

TITLE: "Nondestructive Testing of Discs Made of Titanium Alloys"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981
pp 28-30

TEXT OF ENGLISH ABSTRACT: This paper briefly describes and analyzes the metallurgical defects in disc-like products made of titanium alloys, and also the proper nondestructive testing method that should be chosen according to the characteristics of the alloys.

AUTHOR: JIANG Tinglu [1203 1694 4389]

ORG: Harbin Boiler Works

TITLE: "Application of Acoustic Emission Technique to the Inspection in Welding Process"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981
pp 31-35

TEXT OF ENGLISH ABSTRACT: This paper illustrates the principle of acoustic emission applied in welding inspection and the source of interference noise. Some practical examples are given and their characteristics are discussed. Also discussed are main problems in application.

9717
CSO: 4009/72

Nuclear Techniques

AUTHOR: PAN Haochang [3382 3185 2490]
WEI Shijun [7614 0013 0193]

ORG: Both of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "Optical Crosstalk Discrimination of Liquid Scintillation Counter"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 15-20

TEXT OF ENGLISH ABSTRACT: The crosstalk spectra of a liquid scintillation counter were analyzed and investigated in this paper. We have manufactured a crosstalk discriminator. By using the discriminator in the liquid scintillation counter, the background of measuring ^{14}C was decreased from 3.499 ± 0.059 cpm to 2.222 ± 0.027 cpm; the merit was increased from 1820 to 2738; the efficiency continued to reach 78.0 percent; the empty bottle count was decreased from 4.560 ± 0.0675 cpm to 1.156 ± 0.034 cpm.

AUTHOR: ZHANG Guangming [1728 0342 2494]
ZHAO Deyao [6392 1795 5069]
ZHOU Weizhen [0719 5633 4176]

ORG: All of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "Mercuric Iodide Nuclear Radiation Semiconductor Detector"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 26-28

TEXT OF ENGLISH ABSTRACT: After the crystals are cleft into plates, they are etched in a 5-10 percent KI-water solution to eliminate the damages in the cleft surfaces. The etched crystal plates are contacted with "Aquadag" and palladium wires are attached to the contact with carbon paint. Such a detector is encapsulated in a teflon support. Using a HgI_2 detector with active surface of 8 mm^2 and thickness of about $200\text{ }\mu\text{m}$, a bias of 600 V, at a temperature of 283°K , with pulse shaping time being $3.2\text{ }\mu\text{s}$ and for an uncollimated source, it is shown that the energy resolution (FWHM) of the detector is 1.4 keV for 5.9 keV of ^{55}Fe , 1.7 keV for 22 keV of ^{109}Cd and 3.62 keV for 59.5 keV of ^{241}Am respectively. The linewidth of the electronics is 1.1 keV.

AUTHOR: WEI Baowen [2607 1405 2429]
LUO Shiyu [5012 6108 5940]

ORG: Both of the Institute of Modern Physics, Chinese Academy of Sciences

TITLE: "Stationary Orbit Properties of a Four-fold Symmetrical Radial Sector Cyclotron"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 47-49

TEXT OF ENGLISH ABSTRACT: A particle motion equation has been derived on a four-fold symmetrical radial sector cyclotron and the stationary orbit properties were analyzed numerically for a $2\alpha=52^\circ$ machine. The results showed that the particle motion is relatively stable when the particle energy is less than 100 MeV/A.

9717

CSO: 4009/10

Welding

AUTHOR: NING Feizhang [1380 2431 4545]
YU Fengchi [0060 7685 3069]

ORG: Both of Harbin Research Institute of Welding

TITLE: "The Small Impulse Holes in Electron Beam Weld on Sheet Metal"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION]
in Chinese No 2, Jun 81 pp 47-54

TEXT OF ENGLISH ABSTRACT: The characteristics of small impulse holes in electron beam weld on sheet metal are described. A "high speed fusion" photographic method, by which the cause of formation of the holes was ascertained, facilitated the visual observation of the filament emission and behavior of the beam. The authors found that the small holes were induced by and closely related to the impulsive emission from the filament, which was heated directly with industrial AC power source. The appropriate ways and means to suppress the small impulse holes are suggested in this paper. Bimetal machine saw blades have been welded successfully without impulse hole by electron beam with intensive welding parameters. The welding process is stable; the weld is good in quality. By positioning the seam adjacent to the root of the saw tooth, we may obtain not only a 95 percent saving of high speed steel, but also a prolonged blade life plus better cutting performance.

AUTHOR: MEI Fuxin [2734 4395 2946]
WU Yuehua [0124 2588 5478]
LU Guiquan [4151 2710 0356]

ORG: All of the South China Institute of Technology

TITLE: "On the Study of Underwater Cutting Using Water Jet Technique"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION]
in Chinese No 2, Jun 81 pp 55-62

TEXT OF ENGLISH ABSTRACT: This paper describes the experimental results of underwater cutting for low-carbon steel of thickness $\delta = 8 \sim 23$ mm. Consumable electrode and tungsten electrode water jet techniques are used under analogous conditions in a freshwater tank.

It might be concluded that underwater cutting with the water jet technique for low-carbon steel under normal conditions always results in clear cuts with lower cost and higher cutting efficiency than other underwater cutting methods. Being simple and handy, the tungsten method in particular suits best underwater cutting.

AUTHOR: LI Runmin [2621 3387 3046]
TIAN Wanyu [3944 8001 6877]
LU Huangong [7120 3562 0501]
et al.

ORG: All of Harbin Research Institute of Welding

TITLE: "Cracks Formed in the Heat Affected Zone in Thick-walled Vessels Fabricated with 14Cr2Ni4MoV Steel and Their Effects on Construction Safety"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION]
in Chinese No 2, Jun 81 pp 63-74

TEXT OF ENGLISH ABSTRACT: This paper aims at investigating the properties of welded joints of thick-walled pressure vessels fabricated with 14Cr2Ni4MoV low-alloy high strength steel. It is believed that there were liquation cracks and high temperature low-ductility cracks in the weld heat-affected zone adjacent to the fusion line. The said cracks, under certain conditions, could induce delay cracks. Mechanical tests showed that this region was the weakest in the welded joint, and was the short life region.

AUTHOR: ZHANG Xiangquan [1728 4161 2938]
CHEN Zexin [7115 3419 3512]
ZHOU Guangqi [0719 0342 4388]
et al.

ORG: All of Xi'an Jiaotong University

TITLE: "A Study of Reheat Cracking with the Implant Method--Assessing the Reheat Cracking Susceptibility of 14MnMoNbB, BHW38 and 15MnVNCu Pressure Vessel Steels"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION]
in Chinese No 2, Jun 81 pp 75-84

TEXT OF ENGLISH ABSTRACT: In this paper an implant reheat cracking test by stress relaxation was introduced and a comparison of the reheat cracking susceptibility of three pressure vessel steels, namely 14MnMoNbB, BHW38 and 15MnVNCu, was made. The study of susceptibility was based on two rupture criteria: the minimum initial critical stress and the minimum rupture time shown on the "C"-shaped curve of reheat cracking. The test results revealed that the coarse-grained overheated region of 14MnMoNbB steel was more susceptible to reheat embrittlement than was that of BHW38 steel, while 15MnVNCu steel, being practically free from reheat cracking, was the one least susceptible.

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